Sonic Cone Penetrometer

SUMMARY

The sonic cone penetrometer is a technology enhancement to a standard cone penetrometer. The enhancement allows the application of vibratory energy to aid in advancing the cone penetrometer rods.

The demonstration was performed to assess the ability of the sonic vibratory energy to enhance penetration depth in several types of geologic formations at the Hanford Site.

INNOVATIVE TECHNOLOGY DESCRIPTION

The sonic cone penetrometer uses high-frequency vibrations induced by a special attachment on the hydraulic head of a cone penetrometer. This technology is an adaptation of a standard cone penetrometer technology.

BASELINE DESCRIPTION

The baseline technology is the cone penetrometer.

DEMONSTRATION DESCRIPTION

The demonstration was conducted at three sites on the Hanford Site. Initial pushes were made in the 100-D Area near the "chrome hot spot." The second and third sites were located in the 200 East Area at the head end of the 216-B-2-2 Ditch and the 200 West Area just south of the SX Tank Farm, respectively. The objectives of the demonstration were as follows:

1. Determine if the sonic cone penetrometer can achieve greater depths of penetration than a high-push-capacity cone penetrometer rig using static penetration techniques in Hanford Site soil conditions.

2. Evaluate the ability to penetrate difficult formations using the core barrel and/or samplers.

The depth of penetration varied significantly from push to push, with a maximum depth of 40.8 m (134 ft) at the 200 East Area location and a minimum depth of 1.8 m (6 ft) at the 100-D Area location. Compared to a standard cone penetrometer, the sonic cone penetrometer routinely achieved greater depth of penetration in soils in the 100-D Area but did not measurably aid in increasing the depth of penetration in the 200 Areas.

The core barrel cutting tool was used at two sites to collect soil samples. A sample was collected from the 200 West Area in fine-grained sediment at the 19.8-m (65-ft) depth. Sample recovery was 0% in the 100-D Area.

DETAILS OF BENEFITS

Use of a sonic vibration head for the cone penetrometer technology appears to aid in obtaining greater depths in some geologic formations, particularly those with larger grain sizes. However, penetration was not impacted in others. Full operation of all instrumentation and sensors associated with cone penetrometer application under sonic conditions was not demonstrated.

CONTACTS

Scott Petersen, BHI (509) 372-9126